H. DRY SAGEBRUSH SHRUBLANDS (SB)

27. Wyoming Big Sagebrush Ecological Series

Table 27-1. Full names and short names for the ecological types in the Wyoming Big Sagebrush Ecological Series.

Ecological Type Code	Ecological Type Name	Plant Association Code	Short Name
SB1	Wyoming big sagebrush/Indian ricegrass – Aridic soils – Colluvial and old-alluvial benches and slopes, < 9,000 ft	ARTRW8/ACHY	Wyoming sagebrush/Indian ricegrass – Aridic soils

This is the *Artemisia tridentata* ssp. *wyomingensis* Series of Bunting and others (1987). It includes part of the *Artemisia tridentata* Series of Moir (1983) and Francis (1986), and is considered a climatic series by Moir (1983). Our series also includes part of the Shrub-Indian Ricegrass Series of Dick-Peddie (1993) It is broken out of the *Artemisia* (Sagebrush) Series of Donart and others (1978) and Tweit and Houston (1980), which is much too large.

Stands of this series occupy sites which are usually medium-sized to large and isodiametric in shape. They are usually easy to see on aerial photographs, but may be difficult to distinguish from earlier seral stages of serviceberry shrublands or cottonwood riparian areas.

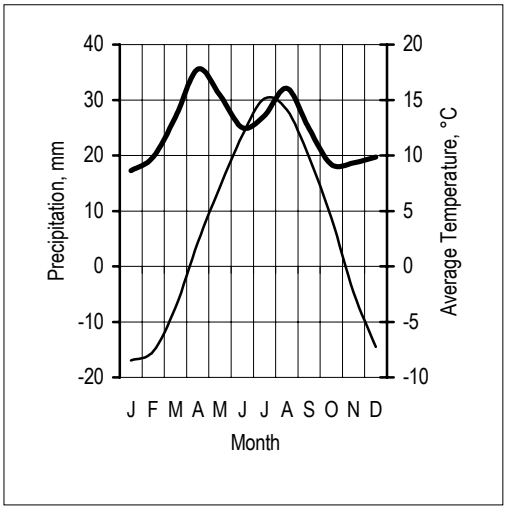


Fig. 27-1. Precipitation and temperature by month at a Wyoming sagebrush site in North Park, north-central Colorado (Terwilliger and Smith 1968).

Vegetation, Climate, Soils

Based on the invasive and increaser nature of this subspecies of big sagebrush, some scientists have postulated that many of the sites now dominated by sagebrush in the western United States were originally grasslands before settlement. However, historical accounts indicate that this is not necessarily true (Vale 1975).

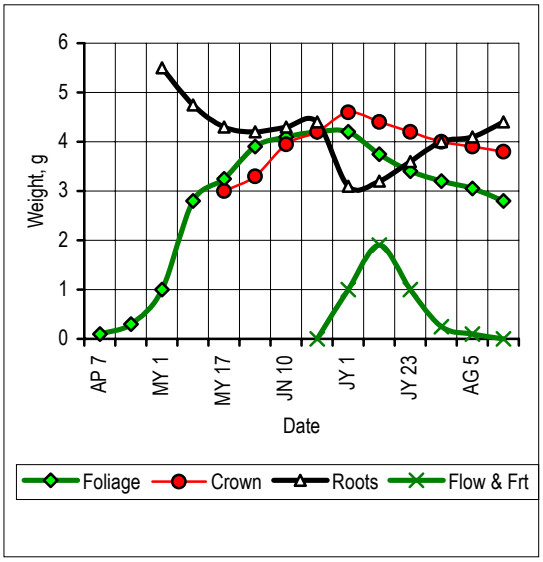


Fig. 27-2. Phenology of Indian ricegrass (ACHY) (Pearson 1979).

Hanson and others (1983) reported herbage production of 882 kg/ha/yr (710-1,150 kg/ha/yr) in southwestern Idaho. They derived an equation relating herbage production (P, kg/ha/yr) to precipitation (p, mm/yr):

$$P = 1.03p + 7.09$$

Table 27-3. Climate and Soils		
Characteristic	**Value**	**Reference**
Annual Precipitation	240 mm/yr (175 - 425 mm/yr) 9.5 in/yr (7 - 16 in/yr) About half of it during the growing season	Ramaley (1942), Cooper (1953), Fisser (1964), Robertson and others (1966), Plummer and others (1968), Tiedeman (1978), Terwilliger and Smith (1978b), Anderson and Holte (1981), French and Mitchell (1983), Hanson and others (1983), Francis (1986), Fisser (1986a), Eckert and others (1986b), Daddy and others (1988), Deblinger and Alldredge (1991)
Growing period	120 - 167 da	Cooper (1953)
Air temperature	Annual: 6°C (2 - 12°C) 44°F (36 - 54°F) Summer: 19°C (16 - 21°C) 66°F (61 - 70°F) Winter: -3°C (-11 – 0°C) 27°F (12 - 32°F)	Cooper (1953), Terwilliger and Smith (1978), Fisser (1986a), Daddy and others (1988), Ferguson and Frischknecht (1983),
Summer soil temperature	16.4°C (12-19°C) 61.5°F (53-66°F)	Ferguson and Frischknecht (1983)

Bartolome and Heady (1978) give age-class distribution diagrams of Wyoming big sagebrush.

Cheatgrass (ANTE6), also called *Bromus tectorum*, dominates many sites of this Series in the Great Basin (Bunting and others 1987), and cheatgrass is increasing on sites of this series the UGB.

It is important to distinguish between sites in this Series where big sagebrush is potentially dominant, versus sites where sagebrush is obviously dominant *now*, but is *not* potentially dominant:

- Sites where sagebrush is seral to riparian shrubs, usually willows (SALIX) or alder (ALINT), or cottonwood (POAN3). These are located on alluvial soils in bottoms with much deeper, less coarse soils and have very different management regimes from climax sagebrush sites.
- Sites where sagebrush is seral to serviceberry (AMUT or AMAL2). These sites are more protected from wind, located either in the lee of ridges or on lower slopes to the lee of high ridges, where deep snow accumulates in winter. These sites have deeper soils which are not necessarily less coarse. Often the vegetation gives some hint of the successional nature of these stands, such as serviceberry with in sagebrush shrubs, or the conspicuous presence of plants usually associated with serviceberry, such as snowberry (SYRO), chokecherry (PAVI11), mat sedges (CAGE or CAPEH) or elk sedge (CAGE2), spike-fescue (LEKI2), or Gambel oak (QUGA).

Soils are usually Aridisols or closely-related soils with an Aridic moisture regime (Fisser 1986a, Eckert and others 1986ab). Soil moisture seems to be insufficient to support deep-rooted, long-lived perennial grasses (Hironaka and others 1983).

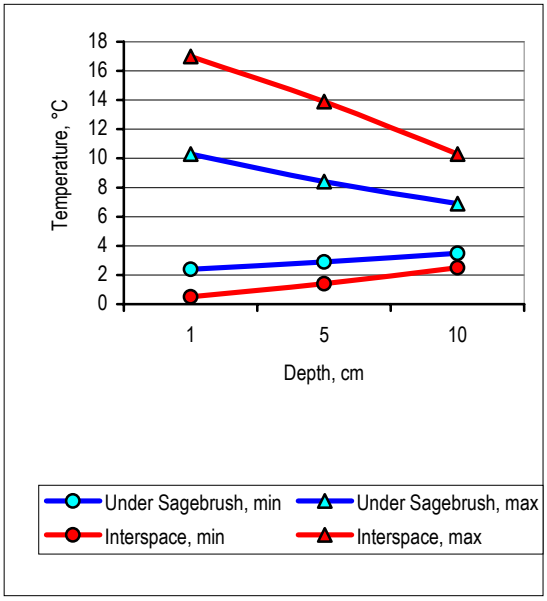


Figure 27-2. Soil temperatures at three depths and two locations (under sagebrush or interspaces between sagebrush plants) on Julian Day 81 (March 22 in non-leap years) at a Wyoming sagebrush site in southern Wyoming (Pierson and Wight 1991).

After soil disturbance, canopy cover of grasses and forbs is correlated with levels of mycorrhizal fungi activity; see Figure 27-6 (Doerr and others 1984). The shallow soil of these sites can be lost very quickly following disturbance, which has apparently happened in many places in the UGB.

Fire Management

Presettlement stand-replacing fires occurred every 40 to 60 years, with smaller, less intense fires every 20 to 25 years. Repeated burning every few

years or burning in summer depletes perennial grasses and allows weeds, invasive forbs, and cheatgrass to increase (Wright and others 1979).

The low productivity and resultant lack of fine fuels makes prescribed burning difficult in this series. Cheatgrass increases the likelihood of fire in mixed sagebrush-cheatgrass sites, but burning may encourage dominance by cheatgrass and weeds (Bunting and others 1987).

Discussion of the relationship between sagebrush canopy cover and fuels is found in Britton and others (1981).

After fire, Wyoming big sagebrush establishes readily from seed if seed is available, but growth and stand recovery are slow (Bunting and others 1987). Repeated burning, or failure to control herbivores after burning, often results in dominance by rabbitbrush (usually Douglas rabbitbrush in the UGB) and very slow recovery of grasses and sagebrush (Bunting and others 1987). Douglas rabbitbrush sprouts quickly after fire. Burning is the most effective way to control Wyoming big sagebrush, but sagebrush cover returns to pre-burn levels after about 30 years (Watts and Wambolt 1996).

Burning is recommended for control of Wyoming big sagebrush, but burned areas must be in large enough aggregates, and sites must be protected from wildlife and livestock for long enough after (at least two growing seasons; Wright and others 1979), to assure recovery of vegetation. Otherwise bare ground generated by overgrazing induces invasion by undesirables such as Douglas rabbitbrush (CHVI8). Blaisdell (1953). cautioned that overgrazing following unrestricted burning causes severe depletion of ranges.

Burning increases grass cover, forb cover, and production within a few years. Within 10 to 15 years of burning, all grasses usually produce more than on unburned sites (Blaisdell 1953). Rabbitbrush and horsebrush sprout after fire, and bitterbrush also recovers if the fire is not too hot. Light burning gives the best results. Sagebrush, which must regenerate from seed, takes somewhat longer to recover (Blaisdell 1953).

Fires should be planned for early spring or after late summer, and caution should be exercised where bitterbrush is dominant (Wright and others 1979).

Range Management

Forage production is low to moderately low at sites of this series (Tiedeman 1978), but these sites are often grazed because of their accessibility and because this type occupies large areas in the UGB that are often free from snow early. Livestock grazing has traditionally occurred from April through November. Where the sites are accessible, they have been grazed year-around since about 1880 through about 1960. Cattle are the most common livestock grazed in the UGB, but domestic sheep have been grazed on a few ranges.

Snakeweed (*Gutierrezia sarothrae*) increases with grazing, while Indian ricegrass (*Stipa hymenoides*) and winterfat (*Krascheninnikovia lanata*) decrease, as does Galleta (*Hilaria jamesii;* Francis 1986), which rarely occurs in the UGB.

In northern New Mexico in two plant communities similar to these Wyoming big sagebrush communities in the UGB, annual (cattle) forage production averaged 170-255 lb/ac/yr at midseral stage (Aldon and others 1988).

In several areas in the UGB, crested wheatgrass (*Agropyron cristatum* or *A. desertorum*) has been seeded following some treatment (such as contour furrowing or spraying) of Wyoming big sagebrush. This was done in order to improve forage for cattle, since crested wheatgrass is palatable to them, and production of crested wheatgrass is negatively correlated with cover of big sagebrush (Rittenhouse and Sneva 1976). In most areas in the UGB, this practice was not successful. The little crested wheatgrass that survived is short and of low vigor and productivity, possibly due to the cold, dry climate (Shown and others 1969).

In one area, exclusion of grazing had no effect on sagebrush canopy cover after 30 years (Watts and Wambolt 1996). In another area, exclusion from grazing increases the aboveground production and decreases root production (Pearson 1965). In a third area, where livestock were removed for 28 years, grass cover increased dramatically, while shrub cover (mostly Wyoming big sagebrush) stayed nearly constant. All of the bunchgrasses increased, especially Indian ricegrass (ACHY), needle-and-thread (HECO26), and bottlebrush squirreltail (ELEL5) (Anderson and Holte 1981).

Recovery time after a period of heavy grazing increases grass cover dramatically, but not at the expense of shrub cover.

Insects and diseases in this series are not documented.

Chemical spraying with 2,4-D has been done extensively in the UGB in past decades, as in other parts of the western United States, generally more before 1980 (Fisser 1986b). Spraying with 2,4-D increases grass cover and litter and decreases bare ground 1 to 5 years after spraying (Johnson 1969, Fisser 1986b, Sturges 1986). Chemical spraying with 2,4-D, plowing, or rotocutting result in return to pre-burn levels of vegetation cover within 10 to 15 years, whereas vegetation cover takes about 30 years to recover after burning (Watts and Wambolt 1996).

In stands of sagebrush sprayed with 2,4-D, soil water depletion was reduced in the upper 1.8 m of soil (Sturges 1993). Where sagebrush was mechanically removed (grubbed), soil water depletion was reduced in the surface 1.2 m of soil, primarily below 0.6 m (Sturges 1980). Heavy grazing increases soil water losses, so heavily grazed sites are dryer (Daddy and others 1988).

Table 27-3. Perennial grass production in different treatments that were grazed/ungrazed by cattle, and sprayed/unsprayed with 2,4-D, in western Wyoming (Fisser 1986b).

Treatment	Perennial Grass Production, lb/ac/yr
Grazed, Sprayed	239 (150 – 355)
Grazed, Unsprayed	168 (115 – 260)
Ungrazed, Sprayed	416 (275 – 580)
Ungrazed, Unsprayed	216 (145 – 380)

Heavy grazing increases soil water losses. Heavily grazed sites are drier, and grazing decreases the biomass of deep (>40 cm) roots and the depth and cover of litter. Moderate grazing may stimulate production of blue grama (Daddy and others 1988). Trampling by livestock significantly decreases the number of sagebrush and grass seedlings, which occur in the interspaces between sagebrush shrubs on ungrazed sites (Eckert and others 1978b). Because Wyoming big sagebrush is reasonably palatable to domestic sheep, especially the young plants, grazing by domestic sheep has been used to control sagebrush (Frischknecht and Harris 1973).

Wildlife Management

Wyoming big sagebrush can be a major constituent of the winter diets of mule deer (Goodwin 1975, Personius and others 1987). When on their winter range, mule deer prefer mountain big sagebrush first, then Wyoming big sagebrush, then other subspecies of big sagebrush, then black sagebrush *much* less (Hanks and others 1973, Ward 1973, Goodwin 1975, Hansen and others 1977, Personius and others 1987, Wambolt 1995). Other major components of mule deer diets include bitterbrush (*Purshia tridentata*), mountain-mahogany (*Cercocarpus montanus*), needlegrasses (*Stipa* spp.) and wheatgrasses (Goodwin 1975, Hansen and others 1977). The use of water developments to improve habitat for pronghorn is of dubious value (Deblinger and Alldredge 1991).

Extensive acreage of this Series occurs within the critical winter range for elk and deer in the UGB, as well as in similar valleys in Colorado (Terwilliger and Tiedeman 1978a, Tiedeman and others 1987). During the winter, most of these sites receive moderate to heavy use by elk, and at least moderate use by deer. Large concentrations of elk began to appear around 1960 and have increased to the present, whereas the deer concentrations are much more cyclic, having peaked last in the early to middle 1950's. Deer on their winter range can kill big sagebrush or cause partial dieback of sagebrush canopy through browsing (McArthur and others 1988).

Recreation, Roads & Trails, Scenery

Sites of this series have low to moderately high suitability for roads and trails, though they are generally are not suitable for construction. Certain areas within this Series have deep soils or steep slopes that present an erosion hazard and should be avoided in routing roads and trails. However, most sites within this Series have gentle to moderate slopes and coarse soils, at least the subsoil. Gentle slopes are technically suitable for developed recreation and dispersed camping, but are rarely used because they are exposed to wind, weather, and animals, and lack cover.

Revegetation and Reclamation

Soils are very droughty and are shallow in some places. Erosion limits revegetation activities on slopes. Shallow soils prevent the use of a drill for seeding, and deeper soils are more moveable by equipment and wind and water erosion, limiting equipment use (Tiedeman 1978). Application of mulch is desirable to conserve soil moisture and limit wind and water erosion, but plowing mulches creates a capillary barrier that actually reduces water infiltration (Tiedeman 1978). Revegetation may require importing topsoil.

Disturbed sites to which topsoil has been added have much better potential for successful reseeding, and also experience good natural revegetation by species such as Indian ricegrass (*Stipa hymenoides*), yarrow (*Achillea lanulosa*), and penstemon (*Penstemon strictus*) (Ferguson and Frischknecht 1983).

When prepared seedbeds are dry, they are often soft, dusty, and not firm enough to create an adequate seedbed, resulting in problems of seedling establishment and erosion (Tiedeman 1978). Snow fences are recommended to increase soil moisture recharge in windy areas. Livestock must be excluded from plantings of grasses and forbs. Plantings of shrubs must be excluded from big game as well (Tiedeman 1978).

In many places, shallow soil limits reclamation, and many of our soils are slippery when wet. Recovery time following a period of heavy grazing increases grass cover dramatically, but not at the expense of shrub cover. There seems to be no correlation between trends in perennial grass cover and precipitation patterns (Anderson and Holte 1981).

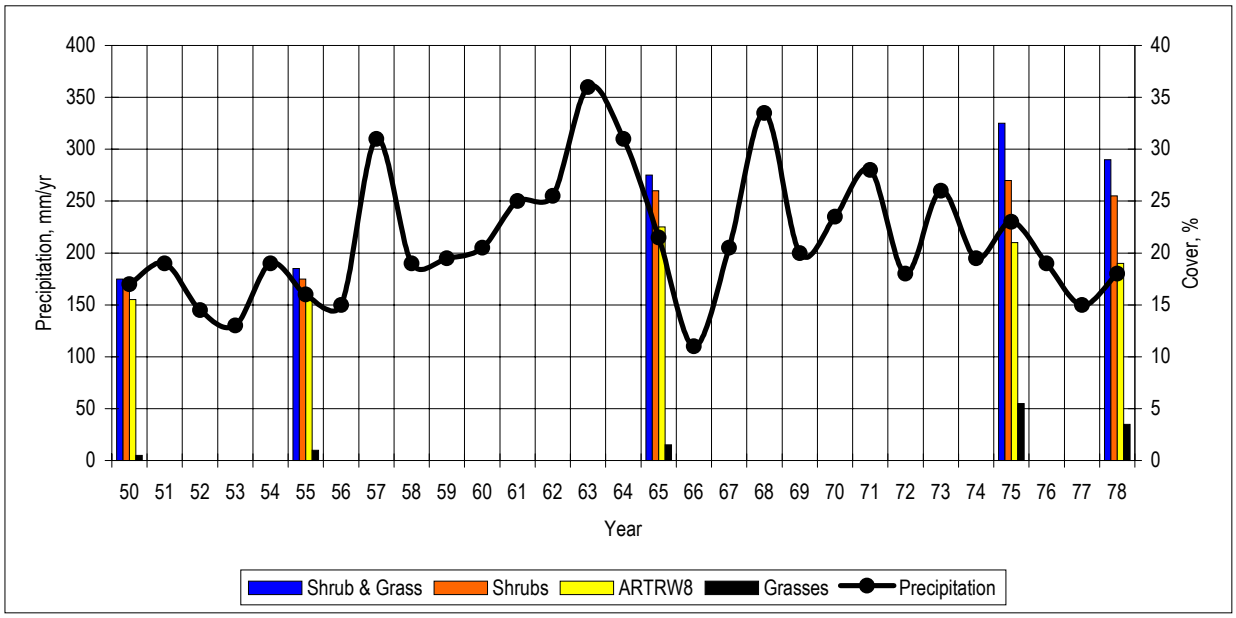


Fig. 27-4. Average precipitation and cover for 28 yr after livestock were removed from an area within the Wyoming sagebrush type in southeastern Idaho (Anderson and Holte 1981)

Table 27-4. Effects of a fall 1974 burn on bighorn sheep range in east-central Idaho (Peek and others 1979).

	Pre-burn	Post-burn			
Characteristic	**1974**	**1975**	**1976**	**1977**	**1978**
Live basal cover, %	6.5	4.0	9.4	12.0	16.4
Litter cover, %	19.1	15.1	16.9	12.3	26.1
Sagebrush cover, %	14.8	2.6	2.0	2.8	
Grass production, kg/ha/yr	129	95	299	185	
Forb production, kg/ha/yr	0	5	33	12	
Shrub production, kg/ha/yr	62	0	6	3	
Total production, kg/ha/yr	192	98	248	197	
Grass grazed, unburned site[1]		7.6	25.0	10.1	22.0
Grass grazed, burned site[2]		73.3	66.0	30.3	35.6

1. Percent of grass plants grazed by bighorn sheep on unburned areas.
2. Percent of grass plants grazed by bighorn sheep on burned areas.

Table 27-5. Characteristics of Ecological Types within Ecological Series 27 in the Upper Gunnison Basin. Numbers are shown in form *Average (Minimum-Maximum)*.

Code Short Name	No. Samples	Elevation, ft	Avg. Aspect, °M (r) Slope, %	Soil Coarse, %	Depth, cm Mollic, cm	Surface: Coarse, % Bare, %	Cover, %: Trees Shrubs Graminoids Forbs	Total Live Cover, % No. Species TLC/NS, %
SB1 Wyoming sagebrush/Indian ricegrass–Aridic soils	32	8,091 (7,660-8,900)	196 (0.31) 16 (1-100)	34 (3-70)	87 (14-175) 21 (0-143)	20 (0-60) 30 (7-55)	0 (0-2) 33 (10-73) 35 (10-86) 10 (2-38)	78.3 (30.7-133.7) 28 (20-51) 2.8 (1.3-5.3)

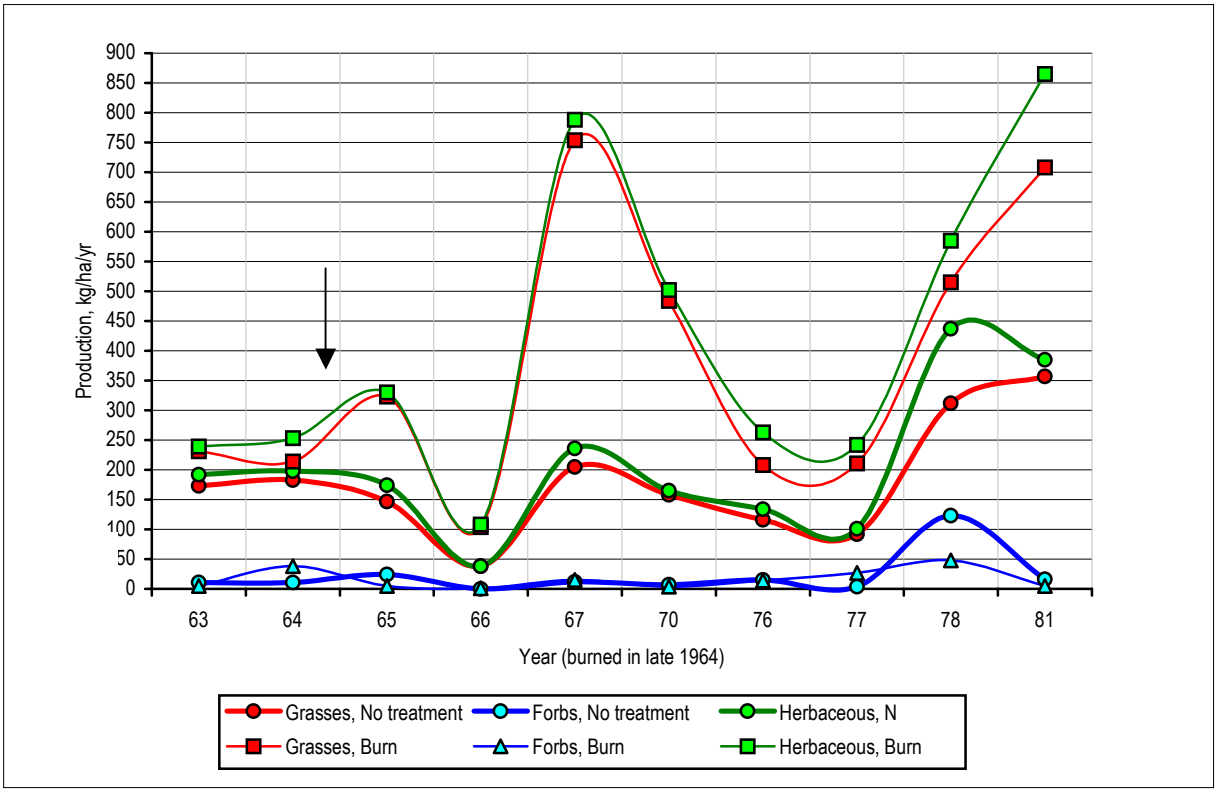
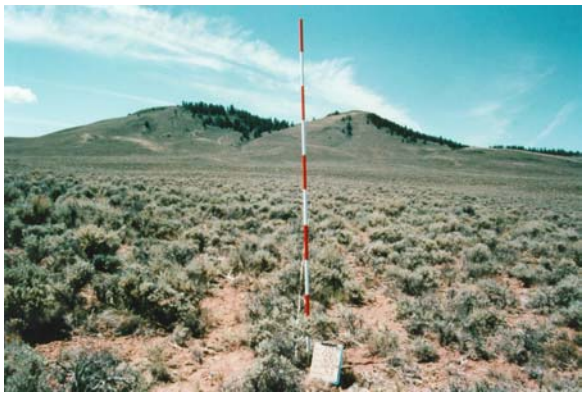


Fig. 27-5. Production in Wyoming sagebrush sites in southwestern Montana before and after a hot fire in late 1964 (arrow) (Wambolt and Payne 1986).

Wyoming big sagebrush/Indian ricegrass sagebrush flats on the old-alluvial bench east of South Beaver Creek, looking southwest toward the West Elk Mountains. Bare soil cover appears to be 35-50%. May 19, 1981.



Looking west across South Parlin Flats, depleted Wyoming big sagebrush in the foreground, Douglas-fir on the north slopes of hills in the background, serviceberry shrublands on facing (leeward) slopes of those hills. July 19, 1994.

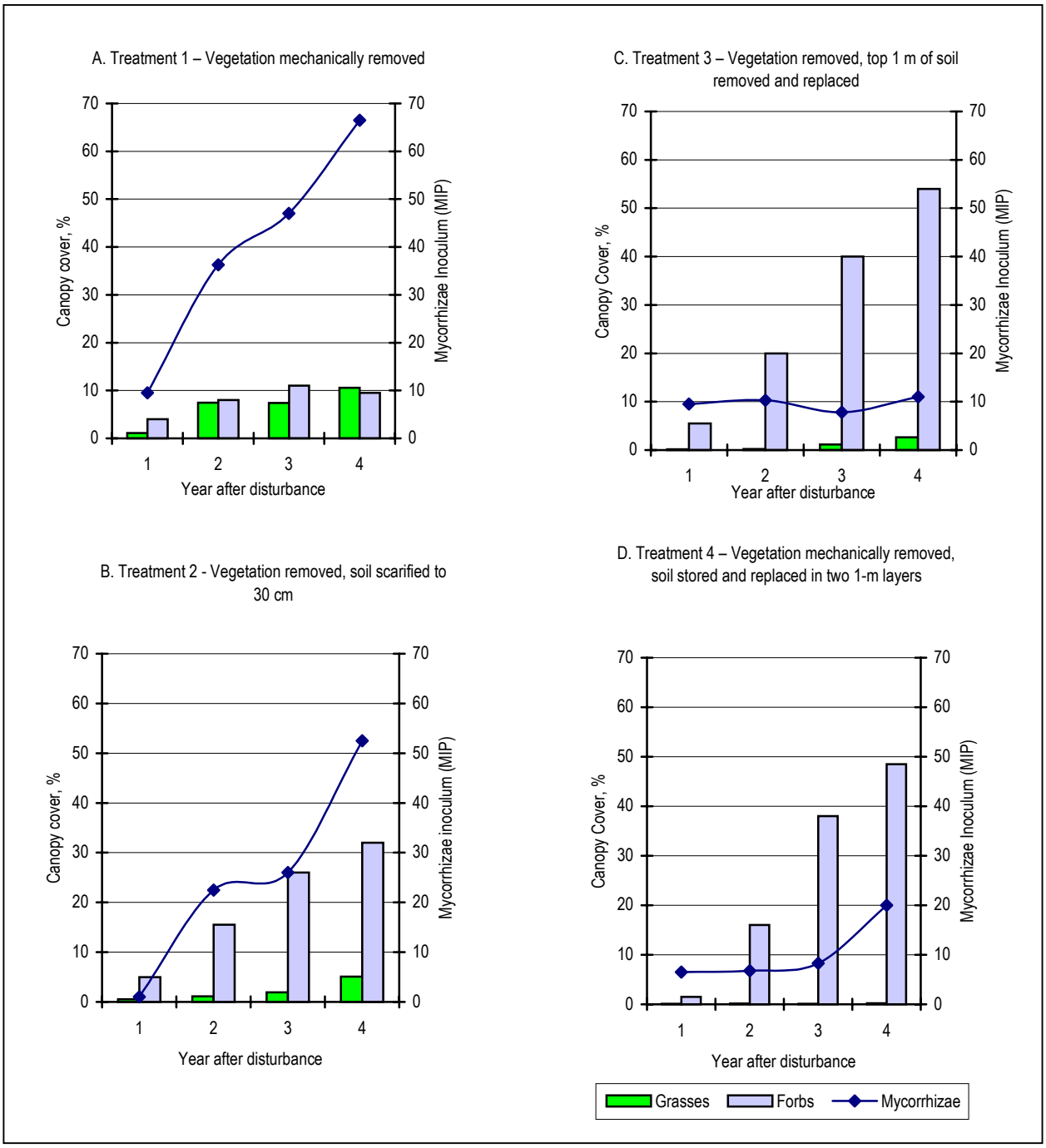


Fig. 27-6. Results of four different revegetation treatments on the cover and symbiotic soil flora (mycorrhizae) in several Wyoming sagebrush stands in northwestern Colorado (Doerr and others 1984)

Wyoming big sagebrush/Indian ricegrass – Aridic soils –
Colluvial and old-alluvial benches and slopes, < 9,000 ft

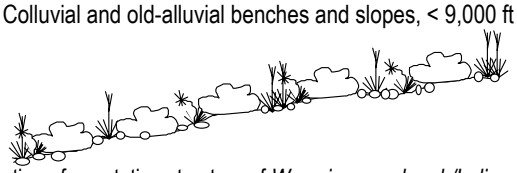


Figure 27-7. Cross-section of vegetation structure of *Wyoming sagebrush/Indian ricegrass–Aridic soils*. The tallest shrub layer typically averages 1.4 ft tall. Aspects are non-northerly, and slope angles average 17%.

Wyoming sagebrush/Indian ricegrass–Aridic soils is a very common type on flats in the very bottom of the UGB, in areas with Aridic (very dry) soils outside the deep rainshadows. In the lower part of the Gunnison Basin, it occurs on benches and flats. This type probably also occurs in northwestern and central-western Colorado, perhaps also in eastern Utah. *Wyoming sagebrush/Indian ricegrass–Aridic soils* is characterized by Wyoming big sagebrush (ARTRW8), Hood's phlox (PHHO) and muttongrass (POFE). Indian ricegrass (ACHY) is usually present in small quantities. See Table 27-9 for common species names and codes. Other distinguishing features include locations in foothills on Aridic soils, old-alluvial benches, and flats.

Wyoming sagebrush/Indian ricegrass–Aridic soils is related to *Indian ricegrass/ needle-and-thread–Aridic soils–Windswept ridge shoulders*, which occurs at somewhat higher elevations always on westerly aspects, on coarser soils, and lacks sagebrush. *Wyoming sagebrush/Indian ricegrass–Aridic soils* is also related to *Big sagebrush/muttongrass–Dark clay soils*, which occurs at higher elevations on soils with less surface coarse fragment cover, and does not have an Aridic moisture regime.

The plant association *Artemisia tridentata* ssp. *wyomingensis/Achnatherum hymenoides* is described as new here, based on *Artemisia tridentata/Oryzopsis hymenoides* (Tiedeman 1978, Johnston 1987), and on *Artemisia tridentata* ssp. *wyomingensis/Poa fendleriana-Stipa comata* (Baker 1982).

Grazing or browsing by herbivores reduces cover of graminoids and forbs. Sagebrush cover may increase slightly with browsing, or may be reduced as this subspecies of sagebrush is relatively palatable. These sites were very heavily grazed by livestock in the decades before World War II because they are accessible and snow melts early in the spring. Some sites may be accessible during all but the most severe winters.

Black sagebrush communities or patches occur on adjacent sites which are shallow to heavy clay. Serviceberry shrublands occur on adjacent protected sites with deeper soils. *Wyoming sagebrush/Indian ricegrass–Aridic soils* is never adjacent to riparian areas.

Horizontal obstruction is very low to low; hiding cover for large animals is nonexistent here. These sites are heavily used by elk and deer, and many sites within their critical winter ranges are open during part of most winters. Sites in better condition support a number of low shrubs palatable enough to herbivores for winter food, including green rabbitbrush (CHVIP5), gray horsebrush (TECA2), winterfat (KRLA2), and dwarf rabbitbrush (CHDE2). Management should plan to increase these palatable species.

Mule deer and elk make moderate use of community types A, B, and C during mild and severe winters, but their use is low during spring through fall. Both deer and elk use community types D, E, and F at moderately low rates for browse during mild and severe winters, and low use during spring through fall.

In most of the larger sage grouse leks in the UGB, this type serves as the hiding cover component of the lek, with black sagebrush communities or windswept grassland serving as the drumming ground itself. Community types A and B receive high to very high use in spring as leks, moderately high use for nesting, but low summer use by sage grouse. Community type C receives moderately high use for leks in spring, moderately low use for nesting, and low summer use. Community types D, E, and F receive moderate use for leks, and low use for nesting and during the summer.

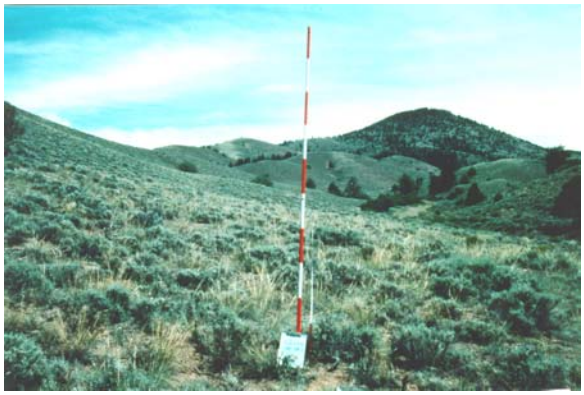
Summary of Ecological Type Characteristics

1. Explanation of symbols in Appendix A. Percentages in [brackets] indicate the percentage of plots sampled that have that characteristic.

NUMBER OF SAMPLES	31, soil descriptions from 11; 4 not assigned to a CT (total 35)
ELEVATION	8,078 ft (7,660-8,900 ft); 2,462 m (2,330-2,710 m)
ASPECT	Usually southerly
LITHOLOGY	Breccia, granite, gneiss, felsite, schist, tuff [59%]; sandstone, mudstone, and shale [41%]
FORMATIONS[1]	Tpl-Tbb-Taf-Tos [44%], Km-Jmj-Jj [38%], Xg-Xfh [19%]
LANDFORMS	Mostly soil creep slopes [50%] or slump-earthflows [25%]
SLOPE POSITIONS	Mostly from upper toeslope to lower backslope [88%]
SLOPE SHAPES	Linear [58%] to convex [42%] horizontally, Mostly linear [83%] vertically.
SLOPE ANGLE	17% (1-100%)
SOIL PARENT MATERIAL	Mostly colluvium [73%], some old-alluvium or colluvium over residuum
COARSE FRAGMENTS	23% (4 - 43%) cover on surface, mostly gravelly [64%] Coarse fragments 34% (3 - 70%) by volume in soil
SOIL DEPTH	87 cm (14 - 175 cm); 34 in (6 - 69 in)
MOLLIC THICKNESS	21 cm (0 - 143 cm); 8 in (0 - 57 in)
TEXTURE	On the surface, a tendency to be sandy: sandy loam-loamy sand-sandy clay loam-sand [63%]; In the subsurface, a wide variety of textures, with sandy clay loam [23%], clay loam [23%], loamy sand [15%], and clay [15%] leading the list
SOIL CLASSIFICATION	Argiborolls [44%], Haploborolls [33%], Haplargids [22%]. Most either an Aridic moisture regime, or a tendency toward one
TOTAL LIVE COVER	77.2% (30-134%)
NUMBER OF. SPECIES	28 (20-51)
TOTAL LIVE COVER/NO. SPECIES	2.8% (1.3-5.3%)
CLIMATE	Usually outside deep rainshadow. Montane climate, warm, dry, exposed to sun, moderately exposed to wind
WATER	No permanent water on or near sites

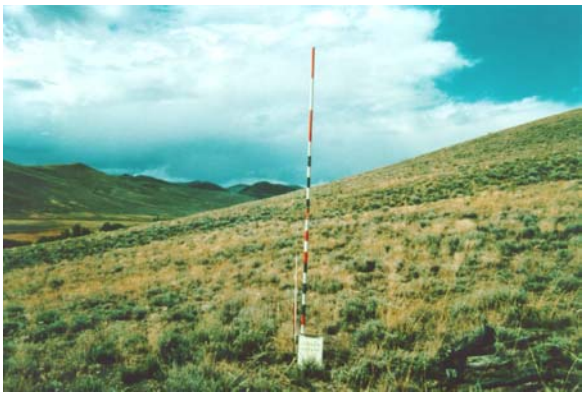
Table 27-6. Wildlife values (relative to the whole UGB) for the principal wildlife species using *Wyoming sagebrush/Indian ricegrass–Aridic soils*. "|" means the same as above.

CT	Sage Grouse Season–Preference	Mule Deer Season–Preference	Elk Season–Preference
A, B	Spring– High to Very High (Lek) Nesting– Mod. High Summer– Low	Winter, Mild– Moderate (Browse) Winter, Severe– Moderate Spring/Fall– Low	Winter, Mild– Moderate (Browse) Winter, Severe– Moderate Spring/Fall– Low
C	Spring– Mod. High (Lek) Nesting– Mod. Low Summer– Low	|	|
D, E, F	Spring– Moderate (Lek) Nesting– Low Summer– Low	Winter, Mild– Mod. Low (Browse) Winter, Severe– Mod. Low Spring/Fall– Low	Winter, Mild– Mod. Low (Browse) Winter, Severe– Mod. Low Spring/Fall– Low

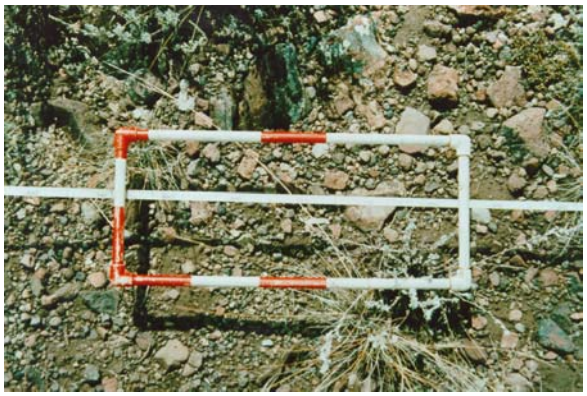


Wyoming big sagebrush/Indian ricegrass type on an old alluvial bench, mapped as Evanston Series within the Gunnison Area Soil Survey. Needle-and-thread 46% cover, blue grama 30%, Wyoming big sagebrush 24%, threadleaf muhly 7%, Indian ricegrass 3%. Coarse Fragments Cover = 4%, Total Live Cover = 116%, Coarse Fragments in Soil = 28. Powderhorn Quadrangle, elevation 8,200 ft, 8% 213° (SSW) slope. August 13, 1993.

The soil pit for the transect above, showing the clearly light-colored surface that indicates the Aridic moisture regime of this soil, which is in turn characteristic of this Wyoming big sagebrush type. Soil sampled as a Borollic Camborthid, Sandy-Skeletal, Mixed. August 13, 1993.



A typical Wyoming big sagebrush stand (Community Type D) on an old alluvial bench. Wyoming sagebrush 25% cover, needle-and-thread 12%, Indian ricegrass 11%, bottlebrush squirreltail 11%. Vegetation is sparse: total live cover only 67%. Soil sampled as a Lithic Haplargid, Loamy-Skeletal, Mixed. McIntosh Mountain Quadrangle, elevation 7,750 ft, 14% 223° (SW) slope. September 6, 1995.



Looking down at the surface along the transect in the photo to the left. Much gravel cover and bare soil. September 6, 1995.

Key to Community Types

1. Total graminoid cover >60%. Needle-and-thread (HECO26) usually >15% cover ..... (2)
1. Total graminoid cover <60%. Needle-and-thread absent to <15% cover ..... (3)

2. Total shrub cover >40% ..... **B**
2. Total shrub cover <40% ..... **A**

3. Total graminoid cover 40-60%. Wyoming sagebrush 10-30% cover ..... **C**
3. Total graminoid cover <40%. Wyoming sagebrush 0-40% cover ..... (4)

4. Total graminoid cover 30-40% ..... **D**
4. Total graminoid cover <30% ..... (5)

5. Total graminoid cover 20-30% ..... **E**
5. Total graminoid cover <20% ..... **F**

Description of Community Types

A *Needle-and-thread-blue grama-Wyoming sagebrush* is dominated by Wyoming sagebrush with 15 to 25% cover. Needle-and-thread is prominent, 10-50% cover. Blue grama (CHGR15) is always present, 5-40% cover. Total graminoid cover ranges from 60 to 90%. Graminoid production ranges from 500 to 700 lb/ac/yr.

B *Wyoming sagebrush-rabbitbrush-muttongrass-pine needlegrass* is dominated by Wyoming sagebrush, 1-45% cover, or by Douglas rabbitbrush (CHVI8), T-40% cover. Pine needlegrass (ACPI2), junegrass (KOMA), and muttongrass (POFE) are usually prominent. Total graminoid cover ranges from 60 to 80%, and graminoid production ranges from 500 to 700 lb/ac/yr.

C *Wyoming sagebrush-muttongrass-needle-and-thread* is dominated by Wyoming sagebrush with 20-30% cover. Needle-and-thread and muttongrass are usually prominent. Total graminoid cover ranges from 40-60%. Graminoid production ranges from 300 to 450 lb/ac/yr.

D *Wyoming sagebrush-sparse Indian ricegrass* is dominated by Wyoming sagebrush at 30-50% cover. Needle-and-thread, muttongrass, and pine needlegrass are sometimes prominent. Indian ricegrass (ACHY) is always present in small amounts, T-15% cover. Total graminoid cover ranges from 30 to 40%, and graminoid production ranges from 200 to 350 lb/ac/yr.

E *Wyoming sagebrush-Hood's phlox* is dominated by Wyoming sagebrush, with 25-40% cover. Pine needlegrass or western wheatgrass (PASM) are sometimes prominent. Hood's phlox is always present, 2-10% cover. Total graminoid cover is 20-30%, and graminoid production is 100-150 lb/ac/yr.

F *Wyoming sagebrush-sparse* is dominated by Wyoming sagebrush at 10-30% cover. The understory is sparse; plant species rarely achieve >10% cover (except sagebrush). Total graminoid cover is <20%, and graminoid production is <100 lb/ac/yr.

Communities Not Assigned to a Community Type

- One community was dominated by rabbitbrush mixed with a little Wyoming sagebrush; the understory was dominated by a thick stand of crested wheatgrass (AGCR), with some smooth brome (BRIN7). This community was seeded to crested wheatgrass in the 1930's and 1940's. The smooth brome was seeded on a nearby roadway more recently, and invaded the site.
- One community supported more Wyoming sagebrush than normal (>60% cover), with a sparse understory. This much Wyoming sagebrush is unusual, and the circumstances that precipitated it are not clear.
- One community was codominated by Wyoming sagebrush, black sagebrush (ARNO4), and cheatgrass (ANTE6). Cheatgrass is invading the warmest parts of the Gunnison Basin, and seems to be covering more territory each year.
- One community was dominated by snakeweed (GUSA2) and Wyoming sagebrush, with a sparse understory. Snakeweed is a semi-native invader shrub that is very persistent.

Table 27-7. Community types within *Wyoming sagebrush/Indian ricegrass–Aridic soils*.

Community Type	No. samples	Elevation, ft Slope, %	Coarseness, % Depth, cm Mollic Depth, cm	Surface Coarse, % Bare, % Seral Stage	Lr	Layer Height, m	Avg Layr Cvr %	Cover, %: Trees Shrubs Graminoids Forbs	No. Species Total Live Cover, % TLC/NS, %	Prod.[1], lb/ac/yr Shrubs Gramin. Forbs	Obstruct'n %: 1.5-2.0 m 1.0-1.5 m 0.5-1.0 m 0.0-0.5 m Total<2m
A. Needle-and-thread-blue grama-Wyoming sagebrush	4	8,148 (8,070-8,200) 7.2 (4-11)	37 (18-55) 162 (155-175) 36 (0-143)	19 (4-41) 24 (20-31) LS	S1 S2 GF ML	0.5 (0.3-1.2) 0.2 (0.0-0.4) 0.3 (0.0-0.8) 0.0	18.2 12.1 65.6 1.9	0 (0-0) 23 (19-26) 75 (62-86) 8 (5-12)	27 (22-31) 106 (98-116) 4.0 (3.4-5.3)	75-103 520-674 31-73	0 0 0 65 16
B. Wyoming sagebrush-rabbitbrush-muttongrass-pine needlegrass	2	8,780 (8,660-8,900) 9.0 (4-14)	37 (25-49) 102 (43-161) 93 (43-143)	12 (4-20) 13 (7-19) LM	S1 S2 GF ML	0.5 (0.3-1.1) 0.2 (0.0-0.4) 0.3 (0.0-0.6) 0.0	10 22 75 10	0 (0-0) 45 (43-46) 69 (65-73) 19 (15-23)	28 (27-28) 132 (131-134) 4.8 (4.7-5.0)	314-360 540-602 87-135	0 (0-0) 0 (0-0) 0 (0-0) 63 (60-65) 16 (15-16)
C. Wyoming sagebrush-muttongrass-needle-and-thread	2	8,418 (8,215-8,620) 4.0 (3-5)	44 (21-67) 40 (33-46) 10 (0-20)	19 (12-25) 23 (15-32) LM	S1 S2 GF ML	0.5 (0.1-0.7) 0.1 (0.0-0.2) 0.2 (0.0-0.6) 0.0	27 8 56 3	0 (0-0) 37 (35-39) 46 (43-49) 9 (9-10)	38 (34-41) 93 (92-94) 2.5 (2.2-2.8)	193-259 312-380 54-57	0 0 0 15 4
D. Wyoming sagebrush-sparse Indian ricegrass	9	8,001 (7,690-8,489) 8.6 (2-35)	35 (15-69) 69 (33-105) 5 (0-17)	15 (1-43) 34 (12-55) MS-EM	S1 S2 GF ML	0.4 (0.1-0.7) 0.2 (0.0-0.4) 0.2 (0.0-1.3) 0.0	23.5 10.6 45.9 1.0	0 (0-1) 35 (26-73) 37 (35-40) 10 (2-26)	28 (22-36) 83 (69-113) 3.0 (2.2-4.2)	102-686 216-273 9-154	0 (0-0) 0 (0-0) 12 (0-35) 70 (60-85) 20 (15-30)
E. Wyoming sagebrush-Hood's phlox	4	7,950 (7,675-8,170) 4.6 (1-9)	17 (3-46) 108 (79-146) 19 (0-30)	18 (0-40) 39 (25-53) EM	S1 S2 GF ML	0.5 (0.1-0.7) 0.2 (0.0-0.3) 0.2 (0.0-0.6) 0.0	34.8 22.8 30.9 0.2	0 (0-0) 35 (27-40) 25 (24-26) 10 (5-14)	27 (21-34) 71 (66-76) 2.7 (2.1-3.1)	108-273 126-135 27-79	0 (0-0) 0 (0-0) 0 (0-0) 58 (45-70) 14 (11-18)
F. Wyoming sagebrush-sparse	11	8,011 (7,660-8,390) 33.3 (3-100)	42 (20-70) 22 (14-38) 2 (0-5)	34 (6-60) 28 (12-46) EM-ES		*		1 (0-2) 30 (10-56) 15 (10-19) 9 (2-38)	28 (20-51) 55 (31-95) 2.0 (1.3-3.2)	41-499 49-99 12-258	2 (0-5) 0 (0-0) 5 (0-15) 20 (10-40) 7 (3-10)

*. Unknown: measurements were not taken in this CT.

Table 27-8. Resource Values for *Wyoming sagebrush/Indian ricegrass–Aridic soils*. Resource values were calculated from the numbers in Table 27-7, relative to the whole UGB.

The numbers in this table can be translated: 0 = Very Low, 1 = Low, 2 = Moderately Low, 3 = Moderate, 4 = Moderately High, 5 = High, and 6 = Very High.

	Community Type					
Resource Value	**A**	**B**	**C**	**D**	**E**	**F**
Potential Cattle Forage Production	3	3	2	1-2	1	0
Grazing Suitability	3	3	2	2	1	0
Wetland	No	No	No	No	No	No
Riparian Area	No	No	No	No	No	No
Developed Recreation	1	1	0	0	0	0
Dispersed Recreation	2	2	1	1	1	1
Scenic	1-2	1-2	0-1	0-1	0-1	0-1
Road & Trail Stability	5	5	5	5	5	4
Construction Suitability	4-5	4-5	4-5	4-5	4-5	3-4
Deer & Elk Hiding Cover	1	1	0	1	1	0-1
Deer & Elk Forage & Browse	2	2	2	1	1	0-1
Sage Grouse Cover	5	5	1-2	5	4-5	1-2
Sage Grouse Nesting/Brood Potential	4	4	2-3	1-2	1-2	1-2
Need for Watershed Protection	1	1	1	1	1	1
Soil Stability	5	5	5	5	5	3-4
Risk of Soil Loss-Natural	1	1	1	1	1	2
Risk of Soil Loss-Management	2	2	2	2	2	3
Risk of Permanent Depletion-Range	2-3	2-3	3	3	3	3
Risk of Permanent Depletion-Wildlife	3-4	3-4	3	3	3	3
Resource Cost of Management	3	3	3	3	3	3
Cost of Rehabilitation	4-5	4-5	4-5	4-5	5	5

Table 27-9. Common Species in *Wyoming sagebrush/Indian ricegrass–Aridic soils*, where Characteristic cover > 10% or Constancy > 20%. "–" means that the species is not found. Dead cover is not listed. Ccv = Characteristic Cover, Con = Constancy. If Avc = Average Cover, then these are related using the formula Avc = Ccv•100%/Con.

	Community Type	A	B	C	D	E	F	
		Ccv(Con)	Ccv(Con)	Ccv(Con)	Ccv(Con)	Ccv(Con)	Ccv(Con)	
Code	Species	N = 4	2	2	9	4	11	Common Name
	TREES							
JUSC2	Juniperus scopulorum	– –	– –	– –	1 (11)	– –	1 (73)	Rocky Mountain juniper
	SHRUBS							
ARNO4	Artemisia nova	– –	– –	– –	5 (22)	1 (25)	5 (64)	black sagebrush
ARTRW8	Artemisia tridentata ssp. wyomingensis	21(100)	21(100)	26(100)	27(100)	32(100)	22(100)	Wyoming big sagebrush
CHVI8	Chrysothamnus viscidiflorus	T (75)	19(100)	6(100)	5 (67)	3 (75)	3 (91)	Douglas rabbitbrush
LEPU	Leptodactylon pungens	1 (50)	2(100)	T (50)	T (11)	– –	2 (9)	granite gilia
OPPO	Opuntia polyacantha	T (25)	– –	T (50)	T (22)	1 (50)	1 (45)	plains prickly-pear
PUTR2	Purshia tridentata	– –	– –	– –	– –	– –	1 (64)	antelope bitterbrush
SYRO	Symphoricarpos rotundifolius	T (25)	2(100)	T (50)	1 (22)	– –	1 (73)	mountain snowberry
TECA2	Tetradymia canescens	T (50)	T (50)	2(100)	2 (67)	1 (50)	2 (9)	gray horsebrush
	GRAMINOIDS							
ACHY	Achnatherum hymenoides	7 (75)	3 (50)	3(100)	3(100)	4 (50)	2 (91)	Indian ricegrass
ACPI2	Achnatherum pinetorum	11 (50)	10(100)	7(100)	10 (89)	12 (75)	3 (64)	pine needlegrass
ANTE6	Anisantha tectorum	– –	– –	– –	25 (11)	– –	5 (55)	cheatgrass
CAGE	Carex geophila	– –	– –	T(100)	2 (44)	– –	1 (45)	dryland sedge
CHGR15	Chondrosum gracile	22(100)	T (50)	2(100)	2 (56)	T (25)	2 (82)	blue grama
ELEL5	Elymus elymoides	3(100)	3(100)	T(100)	6 (89)	4 (75)	1 (82)	bottlebrush squirreltail
HECO26	Hesperostipa comata	30(100)	20 (50)	11(100)	9 (33)	5 (50)	3 (45)	needle-and-thread
KOMA	Koeleria macrantha	14 (50)	16(100)	T(100)	10 (22)	4 (25)	T (18)	prairie junegrass
PASM	Pascopyrum smithii	T (25)	3 (50)	1(100)	5 (56)	6 (75)	1 (27)	western wheatgrass
POFE	Poa fendleriana	2 (50)	21(100)	21(100)	8 (78)	1(100)	3 (91)	muttongrass
POSE	Poa secunda	– –	– –	– –	5 (11)	1 (25)	2 (45)	Sandberg bluegrass
	FORBS							
ANSE4	Androsace septentrionalis	– –	1 (50)	T (50)	T (44)	T (75)	1 (36)	northern rock-jasmine
ANPA4	Antennaria parvifolia	– –	3 (50)	T (50)	T (22)	T (25)	T (36)	smallleaf pussytoes
ARFR4	Artemisia frigida	1 (75)	5(100)	T (50)	1 (78)	4 (75)	1 (45)	fringed sagewort
ASCO12	Astragalus convallarius	– –	– –	2 (50)	1 (78)	T (25)	– –	lesser rushy milkvetch
BOCR3	Boechera crandallii	– –	– –	– –	1 (11)	– –	1 (73)	Crandall rock cress
CHDO	Chaenactis douglasii	– –	– –	T (50)	T (33)	T (50)	1 (9)	pincushion
ERCO27	Erigeron concinnus	1 (50)	T (50)	T(100)	2 (44)	T (75)	1 (64)	Navajo fleabane
EREA	Erigeron eatonii	1 (50)	6 (50)	2 (50)	T (33)	– –	1 (27)	Eaton fleabane
PECA4	Penstemon caespitosus	1 (25)	1 (50)	T(100)	2 (78)	1 (75)	T (82)	beardtongue
PHHO	Phlox hoodii	6(100)	4(100)	5(100)	6 (89)	4(100)	4 (45)	Hood's phlox
PHRO4	Physaria rollinsii	– –	– –	– –	T (56)	T (50)	T (9)	Rollins' twinpod
SCLI	Schoenocrambe linifolia	– –	– –	– –	– –	– –	1 (64)	skeleton mustard
SPCO	Sphaeralcea coccinea	T (25)	3 (50)	T(100)	T (22)	T (25)	T (18)	scarlet globe mallow
TRGY	Trifolium gymnocarpum	– –	1 (50)	1(100)	T (56)	T(100)	1 (9)	holly-leaf clover
FORB	forb unknown	– –	1 (50)	T(100)	T (33)	1 (75)	1 (9)	unknown forb
	GROUND COVER							
.BARESO	bare soil	24(100)	13(100)	23(100)	34 (89)	39(100)	28 (27)	
.LITTER	litter and duff	56(100)	72(100)	55(100)	50 (89)	42(100)	43 (27)	
GRAVEL	gravel 0.2-10 cm	9	12	19	11	13	20	
.COBBLE	cobble 10-25 cm	2 (50)	– –	– –	2 (33)	2 (50)	7 (18)	
.STONES	stone > 25 cm	– –	– –	– –	2 (11)	1 (50)	4 (18)	
.MOSSON	moss on soil	2(100)	9 (50)	– –	2 (11)	– –	1 (9)	
LICHENS	lichens on soil	–	1	2	3	T	2	